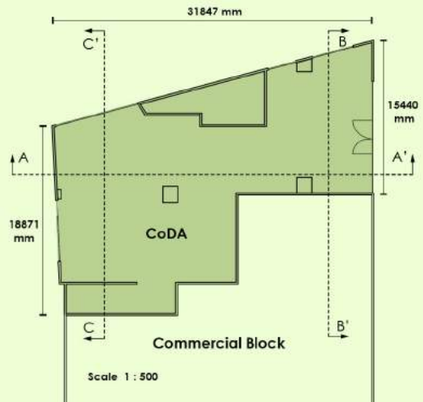
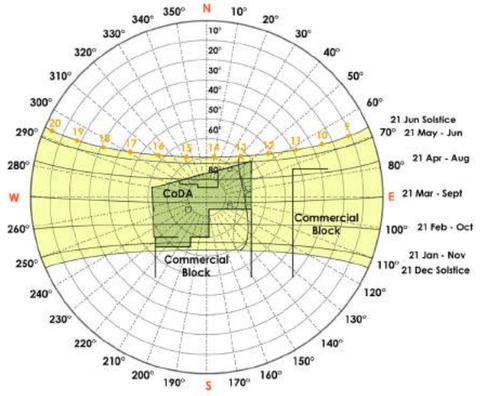
Coordinates 3.0643355 N
101.6159495 E
Location Commercial block
Jalan Taylor's
47500 Subang Jaya,
Selangor Darul Ehsan
Malaysia.

CoDA is a dedicated space located at the ground floor of Taylor's University commercial block to allow students to exhibit their works. Originally, there are multiple storeys above the space. **For the purpose of this assignment, we shall assume that CoDA is a single storey space with a flat concrete roof of its own.**

CODA FLOOR PLAN



SUN CHART

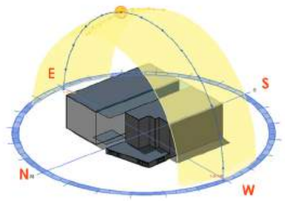


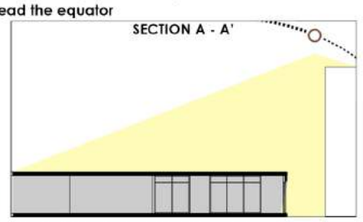
SUN PATH

21ST MARCH AND 23RD SEPTEMBER (EQUINOX)

The position of the sun is directly overhead the equator

12 00 PM



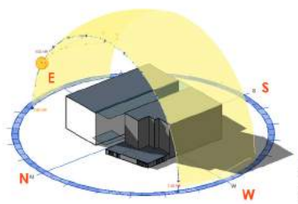


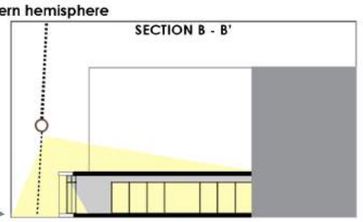
Direct sunlight exposure as the sun is almost directly above CoDA. The concrete flat roof is fully exposed to solar radiation, allowing heat to be conducted into the interior

21ST JUNE (SUMMER SOLSTICE)

The Sun's position is closer to the Northern hemisphere

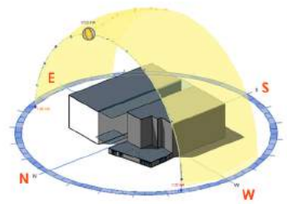
9 00 AM

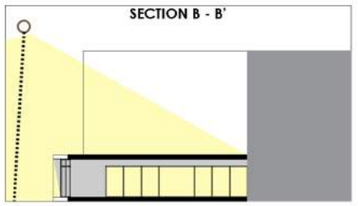




Partial sunlight exposure is experienced by CoDA as it is shaded by the commercial building on its east

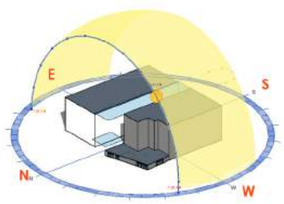
12 00 PM

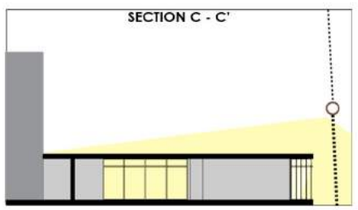




The concrete flat roof and the north façade is fully exposed to solar radiation, allowing heat to be conducted into the interior

4 00 PM

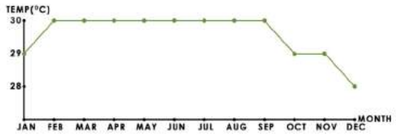




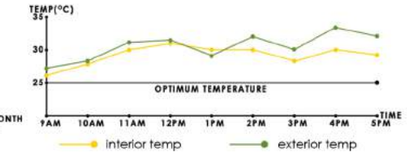
Direct sunlight exposure is experienced by the roof, the north and west façade. The east façade is fully shaded

TEMPERATURE & HUMIDITY

ANNUAL TEMPERATURE OF SUBANG JAYA TEMPERATURE OF CODA

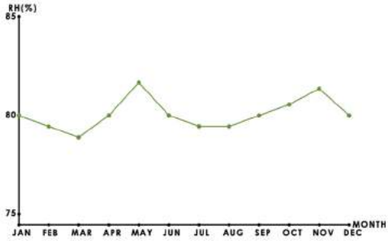


Average maximum temperature: 30 degrees celcius
Average minimum temperature: 23 degrees celcius



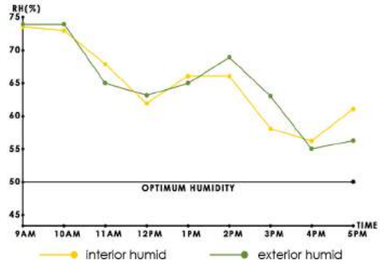
Average interior temperature of CoDA: 31 °C
Average temperature of Subang Jaya: 30°C
Conclusion: Average interior temperature of CoDA is 1 °C higher than Subang Jaya, inidicating that the space is slightly hotter and uncomfortable

ANNUAL HUMIDITY OF SUBANG JAYA



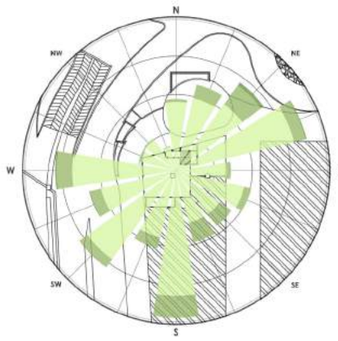
Average relative humidity: 80%
On average, May is the most humid
On average, March is the least humid month

HUMIDITY OF CODA



Average relative humidity of CoDA's interior: 64.9 %
Average relative humidity of Subang Jaya: 80 %
Conclusion: Relative humidity of CoDA's interior is 15.1 % lower than Subang Jaya as a lower amount of precipitation is experienced by Taylor's University

WIND ROSE



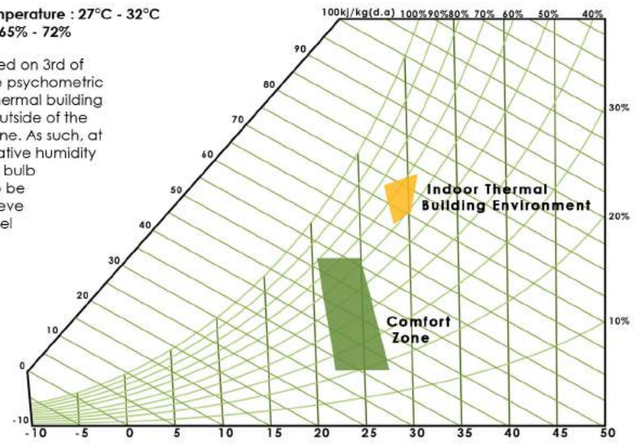
Direction	West				North-North East				East-North East			
Wind Speed (km/h)	0	>1	>5	>12	0	>1	>5	>12	0	>1	>5	>12
Hours per Year	61	623	106	5	48	441	89	1	64	732	79	5

The winds blowing from the South and East Northeast are obstructed by the commercial buildings.
Prevailing wind directions on site are from the West and North Northeast, in which the wind blowing from the West has higher frequency.
Average wind velocity is 3km/year and highest wind velocity is 15km/year

PSYCHOMETRIC CHART

Indoor Dry Bulb Temperature : 27°C - 32°C
Relative Humidity : 65% - 72%

The data was plotted on 3rd of May 2017. From the psychometric chart, the indoor thermal building environment was outside of the thermal comfort zone. As such, at least 15% of the relative humidity and 7 °C of the dry bulb temperature has to be decreased to achieve human comfort level



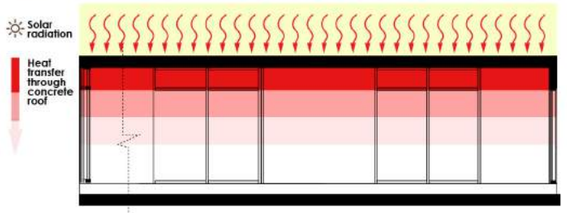
THERMAL PERFORMANCE OF ROOF MATERIAL

Material	Thickness (m)	Thermal Conductivity [W/(mK)]	Thermal Resistance [m²C/W]	U- Value [W/m²k]
Outside Surface			0.055	
Waterproof Layer	0.07	0.17	0.41	
Moisture Barrier	0.003	0.055	0.55	
Concrete Slab	0.05	1.16	0.04	
Concrete Floor	0.2	0.39	0.51	
Inside Surface			0.123	
		Total	1.688	0.592417062

The low thermal resistance of the concrete slab and floor allows the roof to have a higher U-value.

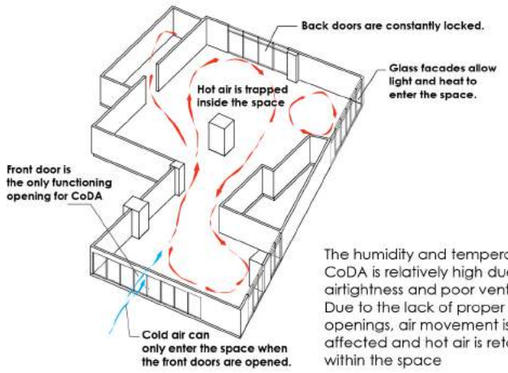
EXISTING CONDITION

HEAT TRANSFER THROUGH CONCRETE ROOF



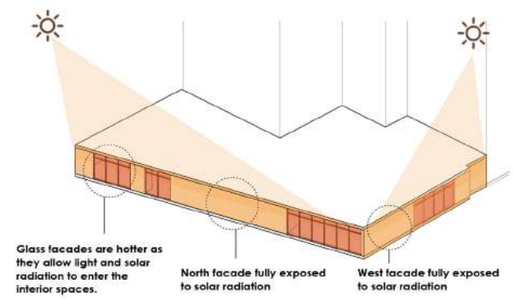
The concrete flat roof of CoDA is one of the main sources of heat transfer within the space. The flat roof is fully exposed to the afternoon solar radiation throughout the year. As the surface of the roof is heated, heat is radiated into the interior environment

POOR VENTILATION



The humidity and temperature of CoDA is relatively high due to its airtightness and poor ventilation. Due to the lack of proper openings, air movement is affected and hot air is retained within the space

LACK OF SHADING DEVICE



At months of the equinoxes, the North and West facades which are not shaded are fully exposed to solar radiation. The wall surfaces not only allow heat to radiate into the interior, but will also conduct heat from the hotter external environment into the cooler internal environment

CONCLUSION

In conclusion, CoDA's indoor thermal building environment falls outside of the thermal comfort zone, as shown by the psychometric chart earlier. As such, At least 15% of the relative humidity and 7 °C of the indoor dry bulb temperature has to be decreased to achieve human comfort level. As such, **passive design strategies** must be implemented for the **roof to reduce heat gain** by solar radiation. **Openings**, such as windows, should be designed to face the prevailing wind directions to allow **natural ventilation** to occur within the building, thus, reducing the relative humidity of the indoor environment

School of Architecture, Building and Design Building Science BLD60803 Tutor : Mr Edwin Chan Yean Liong Members : Teoh Jun Xiang 0322099 Muhammad Mirza Qayyum Bin Mohd Shariff 0324031 Tang Ying Jien 0322357 Tan Min Chuen 0322938 Ng Kwang Zhou 0322802 Lim Woo Leon 0322180 Liew Cherng Qing 0322613 Phares Phung Chimeng 0323554